Introductory remarks for special issue on wind turbine noise

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The effects of wind turbine noise (WTN) on residential populations have become a matter of considerable popular and technical controversy in recent years. Because fewer resources have been devoted to scientific study of WTN effects than to other forms of environmental noise, much speculation and debate still surrounds the origins and nature of effects of WTN.

This special issue presents findings of a thorough cross-sectional field study of community response to wind turbines conducted by Health Canada. The reported study is notable for its scale, design, care in execution, and sophistication of analysis. It assesses both subjective and objective end points, and it identifies limits to the generalizability of reported findings. Substantial quantities of supplementary data, which accompany the articles, may be accessed electronically through the ASA website. The URLs for this material may be found in the individual articles.

As noted by the authors, interpretations of study findings are subject to limitations inherent to the design itself. Most notably, cross-sectional studies cannot establish causal relationships, nor can the Health Canada study be used to make inferences about the presence of health effects that may occur at very low prevalence rates. The current findings cannot be generalized to settings in which A-weighted WTN levels exceed 46 dB, the upper limit of WTN exposure investigated. The study likewise offers no insight about long term changes in community reaction to WTN beyond the observation that suggests annoyance with WTN does not appear to level off or subside after a year of exposure.

Beyond annoyance, the Health Canada study indirectly suggests that if health effects do exist, they would occur at very low prevalence rates, and that future work in this area could benefit from carefully executed case-control studies in addition to longitudinal studies. Case-control studies would provide an opportunity to study WTN impacts from areas with very low population densities. This is not possible in large-scale cross-sectional studies that aim to assess impacts on a larger population.

A rather strong finding to emerge from this study is that there appears to be a sharp break point at 35 dB where the odds of reporting high annoyance with WTN increase by a factor of 10, and continue to increase further at the highest WTN level category assessed.

This finding lends support to a criterion of meaningful WTN effect at about 35 dB. Such a criterion would be based on the level at which attitudes change, rather than a sleep based limit. The community tolerance level (CTL), analyzed as a part of the paper that models annoyance, provides a good way to compare WTN annoyance to the annoyance caused by more common community noises, such as road traffic. The authors show the close correspondence between the present study and four earlier European studies, lending further support to the use of CTL for comparative analyses

The study further shows that the noise emitted by wind turbines is clearly not the only annoying feature attributed to wind turbines. Annoyance with wind turbines was also related to visual impacts, shadow flicker, and blinking lights. Participants were also found to be concerned for their physical safety. That concern, in turn, was related to annoyance. These findings imply that amelioration of community reactions to wind turbines should consider these factors collectively.

The noise metric that best predicts community response to WTN remains another open question. The Health Canada study examined both A- and C-weighted metrics, which were found to be highly correlated. This may mean only that the several models of wind turbines included in this study all have similar spectral characteristics. The high correlation does not mean that C-weighted assessments may be replaced by A-weighted analyses. Concerns about low frequency noise are best addressed by metrics that are most sensitive to low frequency exposures.

Although A-weighted noise metrics may correlate with community responses to wind turbine noise, this does not necessarily make them the preferred metrics for use in this application. Indeed, the statistical association between A-weighted WTN levels and annoyance in the Health Canada study was especially weak: the base model accounted for only about 9% of the variance when only WTN noise levels were considered. The strength of the model only increased to 58% after other "non-A-weighted" variables were added.

The Health Canada study has clearly advanced understanding of WTN effects, but much remains to be learned.

